5. Exhaustion: collapse obtained, but patient too near death to rally, 1 case, or 7.1 per cent.

It is thus readily seen that in over 71 per cent. of the failures adhesions were responsible. Adhesions are indeed the one great impediment to the successful beginning of a pneumothorax, and the one great obstacle to its becoming complete when started.

Upon looking over this brief review the conclusion is obvious that the method is worth while and that artificial pneumothax as a factor in pulmonary therapeutics has come to stay. Any method whatsoever that shows success in almost 25 per cent. of the cases cannot and should not be disregarded. In the hands of physicians experienced in lung work and having a full knowledge of the very simple technic and of the possible dangers, accidents due to this procedure should be reduced to a minimum, and many individuals otherwise hopelessly doomed should be restored to complete or comparative health and to many years of joy and usefulness.

A CONSIDERATION OF THE CAUSES OF RECURRENT SYMPTOMS AFTER OPERATION FOR GASTRIC AND DUODENAL ULCER.[1]

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The surgical treatment of ulcer of the stomach or duodenum does not terminate with the completion of the healing of the abdominal wound and the discharge of the patient from the hospital. It should properly be followed by a long period of careful after-treatment, extended over months and perhaps years, and directed toward the correction of those accompanying disturbances in the functions of the stomach which are always initiated by the ulcerative process. Such treatment is properly in the domain of the general practitioner from whom such patients are usually referred for operation, or in that of the expert medical man devoting himself to the care of these disorders of the stomach or duodenum. During this postoperative period symptoms frequently arise referable in a general way to the seat of the original trouble, at times at variance with those complained of before operation, at other times mimicking these ante-operative symptoms in some of their aspects, and often

[1] Read at a meeting of the Medical Society of the County of New York. The subject here discussed was assigned by Dr. A. A. Berg, to whom I am indebted for this privilege, as part of a symposium on gastric and duodenal ulcer given from the service of Dr. Berg at Mount Sinai Hospital, New York.

again reproducing with faithful accuracy the original symptom-complex. Much against the usual impression prevalent among medical men these are not always due to the unhealed original lesion, or to its recurrence or to new ulcerations. Much oftener they are caused by other conditions which may be at a distance from the seat of the orignal trouble, or are due to disturbances of the normal physiology of the stomach or duodenum, or are consequent upon the new anatomical relations made at the operation.

For the purpose of pointing out the causes productive of these postoperative symptoms we have made a careful study of all of the patients operated upon for gastric or duodenal ulcer. We have correlated the postoperative complaints of these patients with anatomical and pathological facts made evident at secondary operations and have attempted to show the physiological relationships between the resultant postoperative symptoms and the causative objective findings.

It is essential that one have a clear conception of actual conditions at the time when these patients are discharged from the hospital. The ulceration is not the only condition which the patients have had. Associated lesions are always present which account for many of the symptoms. Anatomical changes in the wall of the stomach are produced by the inflammatory reaction around the ulcer. These lead to hypertrophy or rarely to atrophy of the mucous membrane, with immediate disturbances in the secretory function. Changes in the musculature lead to increased or diminished activity. Frequently mechanical faults in the emptying power of the stomach are added, having been initiated by stenoses of the pylorus or duodenum. The neighboring organs, too, are oftentimes compromised functionally by reflex disturbances and anatomically by adhesions or other abnormalities. Long periods of suffering have gradually brought about a curtailment in the amount of food taken and all of the patients come to operation in a more or less undernourished state.

The methods of surgical treatment which are employed on this service for ulcer of the stomach or duodenum depend naturally on the location of the ulcer and on the presence or absence of associated lesions. The methods are as follows:

1. The ulcer-bearing area is removed by local excision or by resection in continuity of the middle segment of the stomach.

2. The ulcer-bearing area is removed by pylorectomy or partial gastrectomy and a gastro-enterostomy is made.

3. A gastro-enterostomy is made and the ulcer-bearing area is excluded by the string method.

4. In a certain number, for technical reasons, the entire stomach and duodenum are excluded by making a jejunostomy. The patient is then fed through the jejunal tube.

The preparations for these operations, the operations themselves,

and any postoperative complications have all the more intensified the abnormal and undernourished condition present when the patient is first admitted to the hospital. Sufficient time after the operation has not elapsed, owing to the exigencies of hospital economy, for the readjustment to the normal of the accompanying disturbances in the physiology of digestion, and the associated gastritis has not had time to regress and disappear. However, the subjective symptoms have been alleviated and the gnawing pain and the distressing nausea and vomiting have disappeared. The patients believe that a cure has been accomplished and excesses are immediately committed and relatively enormous quantities of food, very often, too, badly prepared food, are taken. What is to be expected immediately happens and gives us the first and perhaps largest group of cases.

Symptoms due to Functional Disturbances. These patients begin to complain immediately after their discharge from the hospital. The most common symptom is vomiting and very soon, if not corrected, pain appears, also pyrosis and gaseous eructations. Inquiry discloses the fact that food is being taken in too large quantities and the passage of the stomach tube reveals an abnormal residue of undigested and foul food detritus. Such a state of affairs was exemplified by one of our patients:

He was a man in the forties who had been operated upon for a perforated ulcer of the duodenum. A gastro-enterostomy had been made and the ulcer-bearing area had been excluded by the string method. Upon his discharge from the hospital he returned immediately to his ordinary diet, which was as follows: Breakfast: cereal, several eggs, several cups of coffee, and several rolls. Dinner: several eggs, fish, rolls, and coffee. Supper: soup, meat, potatoes and other vegetables and tea. It was to be expected that the man would complain. The distress which he had at first was soon augmented by nausea and relieved by frequent vomiting, symptoms which had not been present before operation.

This group of postoperative symptoms, which are the most commonly encountered because the patients are difficult to control after leaving the hospital, are easily relieved by a carefully arranged diet and a systematic course of stomach washings.

Ulcer of the stomach or duodenum is almost always associated with changes in the quality and relative quantities of the ingredients of the gastric juice. In the majority there is an hyperacidity, in the minority an hypoacidity, in a very few an anacidity. It is found that following the operation these changed conditions tend to adjust themselves and return to the normal. In the one case the amount of acid increases and in the other it diminishes. The hyperacidity present before operation may have been of an excessive degree, and it then frequently happens that the postoperative fall has not been sufficient to approximate to the normal and a state

of relative hyperacidity persists. Or it is found that the relative acidity having fallen to the normal level, returns after a short interval again to a hyperacid state. Hand-in-hand with this there is always associated a disturbance in the muscular activities of the stomach, leading to a delayed motility, so that abnormal residues are always found in the stomach.

This disturbed condition of the normal secretory function gives rise to symptoms that appear immediately or very shortly after operation. The great majority of these symptoms originate in indiscretions in diet; very few are due to a relative insufficiency in the size of the stoma. The usual symptoms are pyrosis and belching. Secondary symptoms due to a reflex interference with the motility of the large intestine lead commonly to various degrees of constipation, and in a few cases to diarrhea. With the gradual return of the normal strength of the patient and with ordinary judicious care these disturbances tend to right themselves. These cases form perhaps the second largest group.

The postoperative constipation may be a continuation of a similar condition which had preëxisted before operation and perhaps before the onset of the symptoms referable to the stomach or duodenum. Or it may represent an expression of a general atonic condition in which all of the abdominal viscera take part, produced by the handling of stomach and intestine during the operative procedures. It is difficult sometimes to distinguish between these two, and the test usually lies in the after-treatment. In the latter group the condition tends to improve quickly and spontaneously; in the former the condition is very stubborn and requires attention over a long period of time.

The diarrhea which may appear in a few patients is usually a new symptom and is due to changed physiological conditions in the stomach and small intestine, especially to the changes in the gastric and intestinal juices. It may be very mild and then is cause for little or no complaint. It may occur in periods separated by intervals in which the bowels act normally. In this group it is generally of moderate severity. In very rare instances the bowel evacuations are very profuse and are repeated with great frequency. The prognosis here becomes very grave, and almost always these cases go on to a fatal issue. There is no adequate treatment known for the grave form. In the other two groups the treatment must be directed toward the correction of the abnormally changed secretions of the stomach and small intestine and should be based on competent examinations of stomach contents and bowel evacuations.

Several other conditions giving rise to diarrhea after gastroenterostomy are pointed out by Mathieu and Savignac.[2] These are (1) gastrocolic fistula, (2) incomplete stenosis of the bowel,

[2] Arch. d. Mal. de l'App. Dig., 1913, vii, 511.

and (3) jejunal ulcer. The first and second can usually be diagnosed by the roentgenograph; the third is discussed later in this paper.

Other patients are found who frequently begin to complain even before their discharge from the hospital. The symptoms described are exactly the same which were present before the operation. In contradistinction to the clinical course in the previous groups these symptoms do not tend to right themselves nor do they improve with the ordinary medical means. At varying periods afterward secondary operations may be done, and then it is impossible to find traces of any open ulcerations or of the scars of any healed ulcers, or in fact any other intra-abdominal lesion amenable to surgical treatment. It must be assumed therefore that in these patients there had never been any lesion in the stomach and that the original operation had been unnecessary. It may be stated as axiomatic that in order to cure a patient of the symptoms of ulcer of the stomach an ulcer must first of all be present.[3] [4]

Symptoms due to Anatomical Disturbances. Cases are also found in which pain is experienced for a short time following operation. Usually after a period of medical treatment or sometimes spontaneously improvement occurs and becomes permanent. These symptoms are due to a want of accurate apposition in the suture line of the gastro-enterostomy or remaining after the excision of the ulcer-bearing area, with the development of a granulating area which under proper conditions undergoes healing. In no sense should these granulating areas be taken for the so-called peptic ulcerations.

Perhaps more often than we have believed in the past, postoperative symptoms may also be due to the cutting through of one or more of the unabsorbable sutures which we are accustomed to make use of in at least one of the rows of sutures in closing any wound in the stomach or in uniting stomach to jejunum. The symptoms then persist for a long time and would perhaps tend to a spontaneous disappearance after the offending stitch had been cast off, if it were not for the fact that both doctor and patient become restless and a secondary operation is undertaken, which discloses a piece of thread protruding from the suture line. In one of our patients the same cutting through occurred with the exclusion suture, and when the secondary pylorectomy was made half of the string was found hanging free in a much narrowed pyloric lumen.

True peptic ulcerations appear in the line of the stoma or a short distance therefrom in the jejunum in about 2 per cent. of those patients who have a recurrence of their symptoms. The clinical pictures are very characteristic and are as follows:

[3] Mayo, W. J.: Jour. Am. Med. Asso., 1915, lxiv, 2036.
[4] Moynihan: British Med. Jour., 1912, i, 347.

1. A reproduction of the original symptom-complex occurs within a short time after the operation and the patients believe that the old ulcer has reappeared. Progession may be very rapid and perforation with its consequent peritonitis may quickly arise.

2. The symptoms reappear within a short time after operation and continue much the same as before the operation. Most of the cases are in this second group. Sooner or later, too, most of these come to secondary operations.

3. The symptoms develop slowly and gradually a tumor forms in the upper abdomen. At operation one always finds that a fairly large jejunal ulcer has formed, has undergone subacute perforation, and has become surrounded by a large mass of indurated and adherent intestine and omentum. Such a condition is best treated by jejunostomy.

4. A tumor develops as in group 3. Suppuration occurs within it and the abcess ruptures into an adherent hollow viscus.

In other patients the period of good health extends over a much longer period than that indicated in all the previous groups, and the symptoms begin insidiously and increase slowly. With whatever other manifestation the clinical picture begins, vomiting soon appears and becomes prominent. Disturbances are found in the mechanics of the stomach, and these find their origin ususally in a progressive encroachment upon the lumen of the anastomotic stoma. Whenever the pyloric opening has undergone stenosis from some pathological lesion, or whenever the stomach has been unilaterally occluded, an abetting factor preëxists. We have no means except our own experiences in determining the final caliber of our stomata, and we are in the habit of providing for the expected contraction by making the openings overlarge. Nevertheless in a small percentage contraction occurs regardless of anything we may do. In a certain number, too, exuberant folds of mucous membrane falling across the opening of the stoma act as a valve and prevent the proper emptying of the stomach. Such valve formations sometimes occur much earlier. Occasionally, too, symptoms are produced by Murphy buttons when they do not cut through properly.

These symptoms may also be due to badly selected types of operations, such as some of the pyloroplasties, or to properly chosen but badly executed operations. The last are prolific in the production of kinks and other anatomical abnormalities or in the poor functioning of the anastomatic stoma.

At a secondary operation upon a patient who had developed symptoms some time after a gastro-enterostomy had been made for ulcer it was found that the lowermost part of the stoma had been obliterated by contraction. The opening remaining was very small and was situated rather high on the posterior stomach wall. This accounted for the symptoms and for the abnormal residues found in this patient's stomach.

SYMPTOMS DUE TO ANATOMICAL DISTURBANCES IN NEIGHBORING TISSUES. A certain number of the symptoms are due to other causes consequent upon our operations. Herniæ in the abdominal scars have often given rise to pain which closely simulates the pain of ulcer. Only when the herniæ are cured do the symptoms disappear. The literature describes several cases in which symptoms were due to chronic forms of ileus, of which the following are examples:

Moynihan.[5] In a patient with an ulcer of the stomach a suture gastro-enterostomy had been made. The postoperative vomiting persisted for one year after operation and then the abdomen was opened again. A hernia of the small intestine was found projecting into the lesser peritoneal cavity, the neck of the hernia being an opening in the transverse mesocolon adjacent to the stoma. The hernia was cured, the symptoms disappeared, and the patient remained well.

W. J. Mayo.[6] An anterior gastro-enterostomy was made with a Murphy button in a man for an ulcer of the pylorus and lesser curvature of the stomach. On the fourteenth day there were signs of intestinal obstruction which lasted for forty-eight hours. On the sixteenth day the button was passed, and thereafter the patient was discharged well. At the end of a year the patient returned, complaining of constant pain above the umbilicus. At the operation the jejunum was found twisted on its longitudinal axis and had passed behind the afferent loop. The old gastro-enterostomy was divided and a new retrocolic anastomosis was established. The final result is not given.

In a certain number of patients there seems to be a natural predilection toward the formation of postoperative intra-abdominal adhesions. These may be of moderate degree or may be very extensive. They occur also after operations upon the stomach or duodenum. Sometimes these adhesions result from the reparative peritonitis following localized inflammatory areas around the site of the operation, initiated by soiling during the procedures or by slight leakage thereafter. The resulting discomfort bears no relation, mathematically, to the extent of the adhesive peritonitis, but in a certain number the symptoms are apt to be referred to the stomach or duodenum. Sometimes in the course of time these symptoms disappear spontaneously. On the other hand, secondary operations may be found necessary either for persistent pain or vomiting or for acute or chronic obstructions.

Lesions in organs neighboring to or at a distance from the stomach or duodenum are occasionally found to give rise to symptoms which closely resemble those described before operation. The interval of good health may be several months or many years. This is

[5] Duodenal Ulcer, London, 1912. [6] Ann. Surg., 1902, xxxvi, 213.

especially apt to occur with lesions in the appendix and with cholelithiasis. Moynihan describes such a case:

At the primary operation, which was for duodenal ulcer, stones were felt in the gall-bladder and for an unexplained reason these were left undisturbed. Following the operation the pain returned almost immediately and the abdomen was reopened again and a cholecystectomy was performed. The symptoms then disappeared. Such a history tends to question the validity of the original diagnosis.[7]

Other conditions which may give rise to symptoms referable to the stomach or duodenum are lesions in the spinal cord, especially tabes dorsalis and tumors. Patients are known to have been operated upon for gastric or duodenal ulcer who have later developed true gastric crises, the manifestations of which were referred for a time to the stomach and not to the spinal cord.

In the accompanying table it has been attempted to show statistically the pathological lesions which were found at secondary operations. The table includes cases from the literature and cases operated upon on Dr. Berg's service at Mount Sinai Hospital.

	Mount Sinai cases.	Cases from literature.
Contracted pyloroplasty	..	2
Contracted or closed stoma	5	3
Induration at stoma	2	
Murphy button	..	3
Peripyloric adhesions	1	1
Adhesions	..	3
Kink of afferent loop	..	1
Internal hernia	..	3
Healed ulcer	1	
No ulcer	2	2
Cholelithiasis	..	1
Suture ulcer	2	
Gastrojejunal ulcer	2	
Open ulcer and contracted stoma	1	
New ulcer	1	3
Open ulcer at old site	5	

The cases quoted from the literature are from case reports in the papers of Moynihan,[8] Munro,[9] W. J. Mayo[10], Noetzel,[11] Kocher,[12] Kelling,[13] Deaver,[14] Clairmont,[15] and Lieblein.[16] The tabel does not include the cases of gastro-jejunal ulcer described in the papers of Van Roojem[17] and Schwartz[18], nor those in the referate of Lublein.[19]

[7] Moynihan: Loc. cit.
[8] Med.-Chir. Trans., London, 1906, p. 471.
[9] *Tr. Cong. Am. Phys. and Surg.*, 1907.
[10] Loc. cit.
[11] Deutsch. Chirurgen-Kongress, 1906, i, 87.
[12] Ibid., 1906, i, 80.
[13] Ibid., 1906, i, 78.
[14] Ann. Surg., Philadelphia, 1908, xlvii, 891.
[15] Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1909, xx, 330.
[16] Ibid., 1910, xxi, 842.
[17] Arch. f. klin. Chir., 1910, xci, 380.
[18] Ibid., 1914, civ, 694.
[19] Centralbl. f. d. Grenzgeb. d. Med. u. Chir., Ref., 1915, xix, 61.

Recurrent Ulcer. In discussing those postoperative symptoms due to a recurrence of the ulcerative lesions[20] only a few of the points will be mentioned. There are several factors to be considered:

1. The healing of the original ulcer.
2. The recurrence of the original ulcer.
3. The occurrence of new ulcerations.

It is not known which factor, preëxistent before operation, has been remedied or removed by any of the approved methods of operation. We simply know the crude fact that under proper postoperative medical care healing takes place afterward. What we are cognizant of are certain factors which are capable of delaying the healing of the ulcer. Clinically we know that tuberculosis and syphilis exert this delaying effect on all other diseased conditions, and especially on ulcerations on any of the body surfaces. Ulcers of the stomach and duodenum are no exceptions. The effect is produced most often by the toxic influences of a constitutional disturbance, or rarely it is due to local disturbance produced by the growth of tubercle or gumma within the confines of the ulcer. In the postoperative care of these patients these factors must all be reckoned with if a complete cure is to be expected.

Experimentally the work of Silberman,[21] Litthauer[22] and especially that of Creacimone and Anglesio[23] have shown that in animals the production of severe anemias is capable of prolonging the healing of defects much beyond the normal time. Many of our patients are anemic, quite a few profoundly anemic, and these experimental studies point out the necessity of correcting any such condition which may be present.

As regards the recurrence of the ulcerations or the formation of new ulcerations one may say very little for we are as little enlightened in this respect as in the etiology of the original ulcer. One point, however, should be brought out. A certain number are due primarily to infections with bacteria. The reliability of the work of Rosenow[24] and others showing that the portals of entry are frequently the teeth and the tonsils and that a selective localization of these bacteria occur in the stomach has not yet been firmly established. However, we have experiences described by Bolton[25] in which an exacerbation or a recurrence of symptoms had occurred in the course of a medical cure for gastric ulcer which followed a fresh attack of tonsillitis or an increase or reappearance of pyorrhea about the teeth. Many of our patients as we see them clinically,

[20] This subject was discussed in great detail by Dr. A. A. Berg at the symposium at which this paper was presented.
[21] Deutsch. med. Wchnschr., 1886, xxix, 497.
[22] Virchows Arch. f. path. Anat., 1909, cxcv, 317.
[23] Riforma Medica, Naples, 1914, xxx, 1289.
[24] Jour. Infect. Dis., 1915, xviii, 219; Jour. Am. Med. Assn., 1915, lxv, 1687.
[25] Ulcers of the Stomach, London, 1913.

exhibit a most deplorable condition of the teeth. Certainly in view of these experiences these conditions should be corrected.

A symptom-complex has been described by Eppinger and Hess[26] under the term vagotonia. Frequently these simulate accurately the picture of gastric or duodenal ulcer. It is quite within bound that the continued irritation of an old chronic ulcer may give rise to anatomical or functional disturbances of the vagi nerves. With the removal of the cause, however, one should expect that these disturbances would disappear.

In dealing with recurrent symptoms after operation for gastric or duodenal ulcer, all of these factors must be considered in correctly interpreting the clinical picture. Not always is it a matter of ease; frequently it is only decided at secondary operations which are always more or less in the nature of abdominal explorations.

A STUDY OF THE SIGNIFICANCE OF HEREDITY AND INFECTION IN DIABETES MELLITUS.[1]

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Allen, of the Rockefeller Institute, is of the opinion that diabetes is to be looked upon as a functional disturbance rather than as a disease in those organs which have to do with the metabolism of food. Clinical experience, in a measure, tends to support this view. So far as the writer has been able to learn, nomadic tribes and peoples living in a primitive state rarely if ever have diabetes; likewise other degenerative diseases, as arteriosclerosis, cancer, and disorders due to chemical and bacterial intoxications, are quite unknown. It would seem therefore that diabetes is a product of civilization. This phase of the problem, so far as the writer is aware, has never been carefully investigated. If such a thing were possible it would be interesting to study and plot mathematically all of the facts and forces which have played upon the body of the diabetic from the moment of his birth to the beginning of the disease and to correlate with these similar data with reference to his ancestors.

If it were possible to do this one might then be able to determine the influence of heredity, the various infections, chemical intoxications, etc., in the production of diabetes. To one or more of these agencies, at some time or other, has the cause of diabetes been ascribed. Making due allowance for inaccuracy of diagnosis

[26] Ztschr. f. klin. Med. 1910, lxviii, 67.

[1] Oration in Medicine read before the Vermont State Medical Society.